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THE GULF ISLAND EXPEDITION

OF 1966

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THE Vermilion Sea, the Sea of Cortez, the Gulf of California, by whatever name it is known, that long stretch of blue water and its many toast-brown islands is a fascinating place for biologists. "El Golfo" separates Baja California from the Mexican mainland, and thus provides the isolation which has been an important factor in the evolution of the rocky peninsula's strange flora and interesting fauna. Many of the gulf's islands, too, are the home of "endemics," the plants and animals which occur nowhere else. Some of those islands were the objects of investigations undertaken by the California Academy of Sciences, the San Diego Natural History Museum, and the Instituto de Biología of Mexico in April 1966.

During the previous two summers we had "worked" the islands in the southern Gulf. Now we wanted to study the animals and plants and geology of those in the northern part, where the water is colder and most of the islands are larger and higher. Here also are two of the remarkable "bird islands" of the world.

The San Diego Natural History Museum's Vermilion Sea Field Station at Bahía de los An-

geles was the logical starting place for the trip. A cooperative expedition was arranged with Richard P. Phillips, director of the Museum. The expenses of air transportation and ship charter were shared by the Belvedere Scientific Fund of San Francisco and the National Science Foundation.

Early on the morning of April 19 Robert T. Orr, associate director of the Academy, Tom Tilton, a trustee, invertebrate biologist Dustin Chivers, and field associate Raymond Bandar flew to San Diego where they joined Dr. Phillips, botanist Reid Moran, mammalogist and ornithologist Richard Banks, and herpetologist John Sloan, of the Museum staff. At the Tijuana airport, they met Dr. Alejandro Villalobos F., chief of the Hydrobiology Section of the Instituto de Biología, and his assistant Virgilio Arenas, who had arrived from Mexico City the previous day.

Captain Francisco Muñoz, a fine friend of the Academy, loaded the scientists and their hundreds of pounds of collecting gear aboard one of his Lodestar aircraft, which two hours later bounced down on the uneven dirt airstrip at the little turtle-fishing village of Bahía de los Angeles. Sr. Antero

Puerto Refugio,
with the
mountains of
Isla Angel
de la Guarda
rising behind.



Diaz was waiting for them and his 85-foot motor vessel, "San Agustin II," was all ready for the cruise. The scientists' special equipment was transferred from the plane to ship and additional supplies were taken from the Museum's field station. The whine of the electric anchor winch, the clicking of chain links drawn through the hawsehole, and the throbbing of the diesel engines as they came to life quickened the pulses of the biologists. The cruise had started.

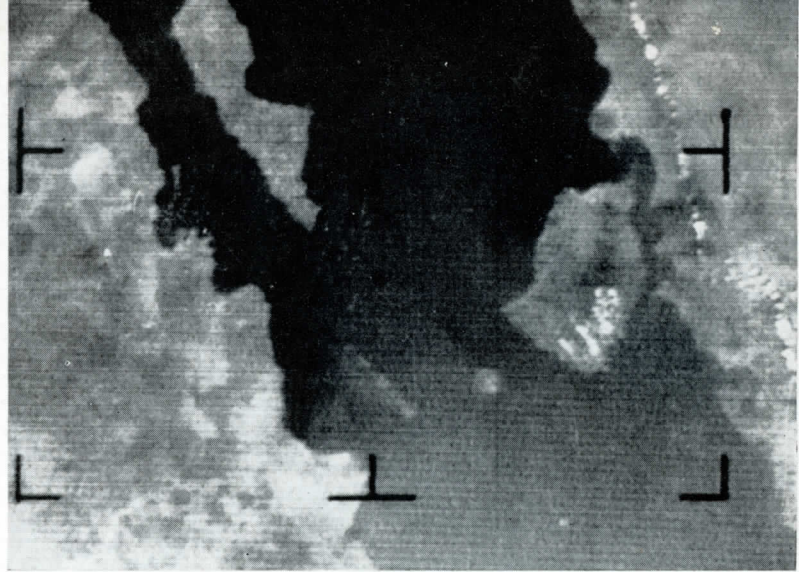
Isla Angel de la Guarda is a large and beautiful chunk of land just off Bahia de los Angeles. It is 42 miles long, up to ten miles wide, and has a rough backbone of rugged mountains between three and four thousand feet high. It lacks fresh water or human inhabitants. Antero Diaz set course for Puerto Refugio, at its northern end, passing through Ballenas Channel. In the old days this was a treacherous area because tidal surge up and down the gulf creates strong currents. Sailing vessels heading against the flow often found themselves going backward, in spite of a favorable breeze and taut sails. Frustrated skippers had to hang behind headlands, waiting for the tide to change, and then their little craft would be pushed forward, almost out of control, by the six-knot current.

The "San Agustin II" experienced only moderate chop as she cruised northward. Finback whales were seen spouting in the distance, and a pod of hundreds of common dolphins joined the ship for a while, seeming to take turns riding the pressure waves on either side of the bow. Others leaped high out of the water.

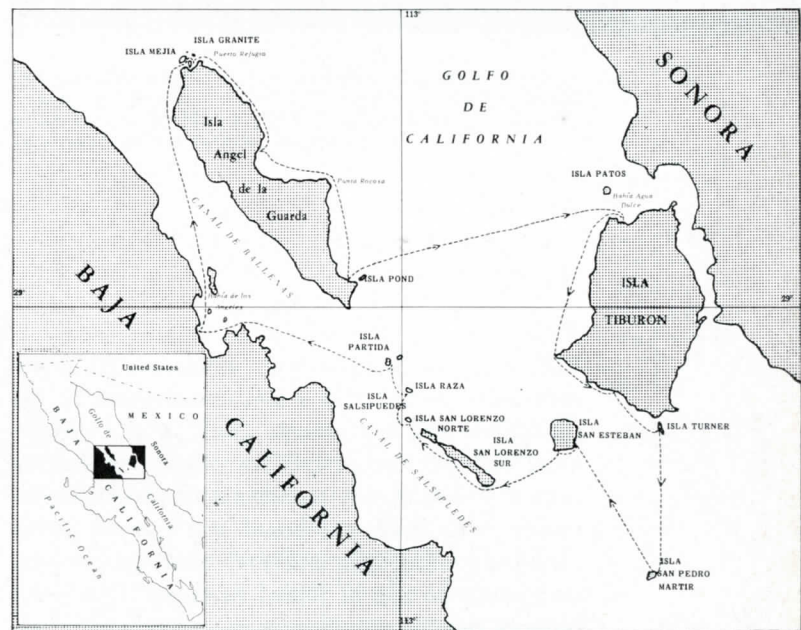
Toward dusk Sail Rock, a tall white guano-covered stack, was passed, and Antero altered course into a narrow passage between Angel de la Guarda and Mejía islands. The engines were throttled down and Mexicans at the bow sang out water depths as the ship slowly moved forward, under the cliffs. At a call the anchor was released and after sufficient chain had rattled down, the ship was reversed to set the flukes, and the engines stopped.

Already the "San Agustin II" was the center of the world, as it would be for the next ten days. It was not a very luxurious center. One cabin below deck in the stern contained eight bunks and little else. It had no windows and only portholes for the upper bunks, but an open hatch at the top of its ladder provided some light and ventilation. Collecting chests and cartons of jars piled between the bunks served as work benches and seats. At least there was no opportunity to become lonely.

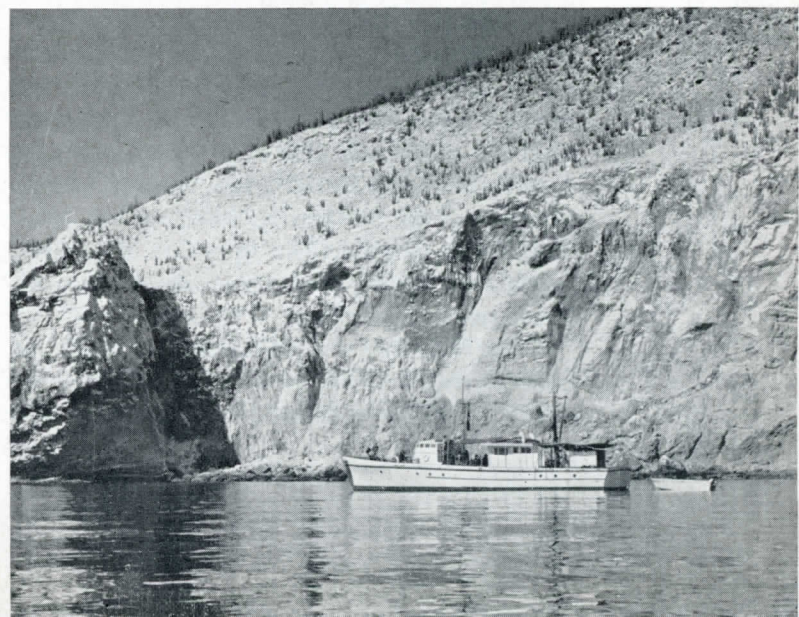
Photographs by Tom Tilton,
Robert T. Orr, and George E. Lindsay



Above, a Nimbus satellite photograph of the northern Gulf of California islands shown on the expedition-route chart, below. (NASA photo. Chart by Dorothy Ludlow.)



Below, the 85-foot "San Agustin II" anchored under the cliffs of Isla San Pedro Martir, a huge rock a thousand feet high and less than a mile across, isolated in the middle of the Gulf.



Below, Dick Phillips, Luis Baptista, Ken Lucas, Dustin Chivers, John Sloan, and Robert Orr on the foredeck of the "San Agustin II" waiting for the next island.



Above right, Invertebrate zoologist Dustin Chivers and Captain Antero Diaz admiring the Gulf "langostas." Right, Dr. Alejandro Villalobos F., our Mexican colleague, and Director Lindsay in the shore boat.



The place was packed with biologists. At night each bunk contained a scientist and some of his collections and equipment. Later in the voyage more than one enthusiastic investigator shared his narrow bed with live rattlesnakes and iguanas in muslin sacks inside cardboard beer cartons. Skinning and stuffing birds and small mammals, or putting plants to dry in folded newspapers between blotters, requires a work area protected from wind. When the air was still this was done on deck, but more often it had to be accomplished in the crowded cabin.

Any minor discomforts were more than compensated for by the amiable and cooperative ship's crew. Two outboard motorboats were always available to take the investigators to shore, or to another island, or to tow a plankton net. There was no grumble even when the trips were late at night or at dawn. The six Mexican crew members seemed anxious that our missions be accomplished, as inexplicable as they must have appeared. Why climb over islands looking for rattlesnakes, or roll boulders in quest of scorpions? Why, indeed!

The little ship was the center from which the scientists, each with his special interest and responsibility to the whole project, went out to explore

and collect. For example, every evening the mammalogists set small snap traps, baited with moistened oatmeal or pieces of walnut, to catch mice or woodrats or other little creatures. This was done on every island, because the little animals show variation from one locality to another, and a sample of each population was desired for the Museum and Academy collections. It was done at night because the mammals are nocturnal, and if the traps had been set too early in the afternoon they would have been sprung by birds or lizards. A tuft of cotton or little flag was fastened to a bush near each trap, to make it easier to locate. And the mammalogists were the first ashore in the morning, long before the sun rose, to get their catch before the ants or warm weather could spoil the skins. Back aboard and after breakfast they were faced with the tedious task of skinning each mouse and carefully stuffing it with cotton, drying its tiny skull because skulls are diagnostic in the science of mammalogy, writing and attaching labels to each specimen, and recording the data in field books. The freshly stuffed skins were pinned to a tray so they would dry correctly. By that time it was usually dark enough to set the next string of traps! Some birds, too, were collected, but only



John Sloan bagging a greenish rattlesnake on Isla Tiburón, with George Lindsay assisting. Sloan collected 166 specimens of reptiles and amphibians, many of which were returned alive for behavioral and other studies.



Ray Bandar, Robert Orr, Luis Baptista, and Dick Banks compare catches of small mammals. Undescribed kinds of animals were found and other interesting discoveries were made on the expedition.

those which were essential for Dr. Bank's study of the avifauna of the Gulf islands. They, also, were carefully skinned and stuffed, their feathers arranged, and the specimens were wrapped in cotton to dry.

Collecting techniques varied with each discipline. Reid Moran was the energetic botanist of the expedition. He had been on all of the islands before, and carried a list of the plants which he had already taken on each one, in order to avoid unnecessary duplication. This gave him time to climb the high peaks and look for rarities not before recorded. Back aboard, these were placed in his enormous plant press and dried over an electric heater which the crew installed for him on the roof of a cabin.

John Sloan knew the best hours to collect his reptiles, and this depended on temperature and light. He, too, had a list of all the reptiles which had ever been taken on each of the islands. Every night he collected with a headlamp, because that is when many of the snakes are out. He also searched in the morning and evening, when the lizards are active. Some were taken alive, with a nylon noose at the tip of a trout pole. Rattlesnakes were "pinned" to the ground and firmly grasped

just behind the head, then picked up and deftly slipped into a snake bag. Some reptiles were shot with .22 caliber dust shot, in order not to damage them as specimens. These were injected with formaldehyde and packed in jars with a liquid preservative.

The marine invertebrate specialists, Dr. Villalobos, Dustin Chivers, and Virgilio Arenas, also "pickled" most of their specimens which they collected in the intertidal area during low water. They used little plastic bags filled with alcohol or formaldehyde solution, but some things, like starfish, gorgonians, and sea urchins, were also dried.

The night was dark there in Puerto Refugio, and finally the generator went off and the ship was quiet. Soft Spanish voices came from the foredeck where some of the crew slept, and occasionally the glow of a cigarette or a song or a laugh. Wavelets lapped against the ship. There was bioluminescence in the water, millions of dots of light, and from time to time a streak as a fish darted by. Apparently this was enough for pelicans, which dove with a loud splash in the quiet night.

Activity started before dawn that first morning, with the sound of the galley pump drawing coffee water. The mammalogists went ashore for



The first flight
of a young
osprey was
photographed
by Robert Orr
and
Tom Tilton
at
Puerto Refugio.

their traps. After breakfast Reid Moran was taken down the coast so that he could climb the highest mountain on Angel de la Guarda. The opportunity to study the plants on this peak was his most important objective of the trip, and the day's work yielded seven additions to the known flora of the island. He also found cirio or boojum trees, *Idria columnaris*, which he had previously discovered on another high peak of the same island. These weird trees, which look like giant upside-down carrots, were known only from Baja California and a small colony near Puerto Libertad in Sonora.

Dick Phillips also spent the day climbing. He is a geologist and is studying the history and structure of this whole region. On this and every subsequent day he hiked far inland, taking rock samples, field notes, and photographs. Or he collected fossils for later study. He has, however, a keen interest in all aspects of biology, and made several important discoveries in these fields as well.

Robert Orr studied sea lions and other marine mammals wherever they were found. That first morning he and Tom Tilton observed, counted, and photographed those on Isla Granite, which protects Puerto Refugio on the north. No animals were killed, but during the expedition many skulls were picked up on the beaches and added to his collection. Nesting pelicans were observed and

photographed, as was a family of ospreys. The parent birds wheeled and cried overhead as a near-mature nestling made its first flight, which ended in a crash landing, apparently without damage to the youngster.

Meanwhile, Dr. Villalobos, Virgilio Arenas and Dustin Chivers made plankton hauls from a small boat and collected marine animals exposed by the receding tide. A special study of the zonation of the plant and animal life was undertaken, and data and collections for a detailed analysis in the laboratory were preserved. Dick Banks and Ray Bandar, after preparing their mammals, were ashore—Dick to observe birds and incidentally to find a rattlesnake, and Ray to hunt for marine mammal bones on the beaches and reptiles on the island. John Sloan continued his methodical hunting and collecting.

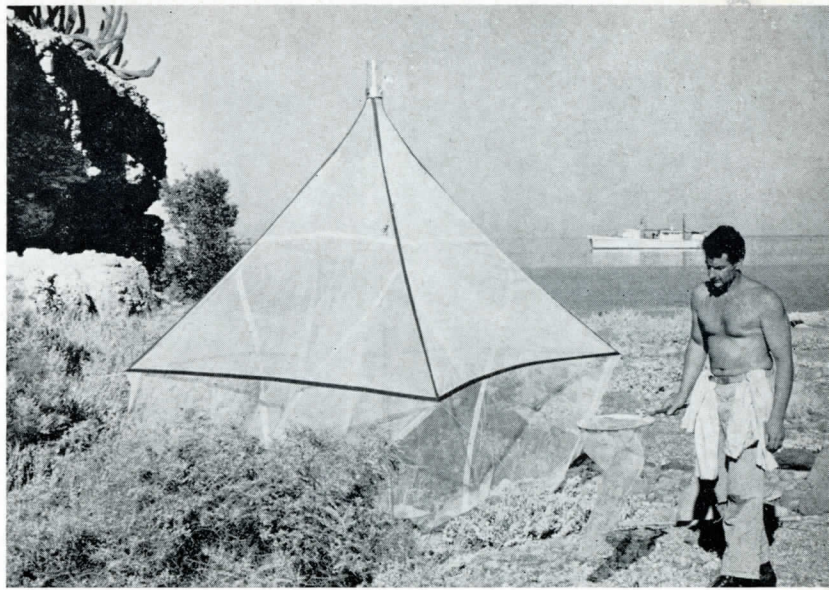
Thus the days were spent. Collecting, studying and preserving specimens. Exchanging information and ideas and sharing a companion's excitement at a rare find. Having a cold beer after sweaty hours on a hot island, and relaxing with refreshments before dinner. Writing notes and observations. Worrying when someone was late returning from a hike, and feeling relief when he finally shouted from the dark beach for a shoreboat. Sitting on deck at night, watching the darting

headlamps and flashlights of herpetologists collecting on shore. Or accompanying those hunters. Expeditions are hard work, and they are great fun. The days went fast.

On April 22 a plane buzzed the ship which was then anchored at Isla Pond. It was bringing George Lindsay, Ken Lucas and Luis Baptista from the Academy to join the group. Landing at Bahía de los Angeles, they came out in a speedboat, laden with extra gasoline and supplies which Antero Diaz had ordered by radio. That evening the Mexicans gave a party on the beach. A green turtle which they captured the night before was barbecued, and delicious rock oysters, collected by the sacksful that morning, were baked on the coals of the beach fire.

Tiburón, the largest island in the Gulf of California, just escapes being a giant peninsula on the Sonora shore, from which it is now separated by a narrow strait called El Infiernillo. Until recently Tiburón was a home of stone-age Seri Indians, and was the subject of wild rumors and tall tales. Within the past two decades the Seris have started to fish commercially, have thus earned money for outboard motors and gasoline for their canoes, and many of the men have cut their hair. Last year Tiburón was declared a preserve and put under the jurisdiction of a special game conservation organization in Hermosillo. Unauthorized visits to, or collecting on Tiburón are prohibited, even for the Seris, whose redoubt area it long had been. There are plans for the commercial development of the shore areas for recreational purposes. Our expedition had been granted special permission to visit and collect on Tiburón, under the condition that it first touch at Bahía Agua Dulce and report to a warden there. This we did. Sr. Alfredo Topete, Jefe de Vigilancia, had been advised that we were coming. We were given permission to land and proceed with our collecting.

Tiburón is 30 miles long and 20 miles wide, and is the only large island on the east side of the Gulf. The plants and animals are typical of adjacent Sonora, but there are Baja California elements as well. Arizona giant cacti or saguaros grow with the Baja California giants, or cardóns. The sour pitahaya cactus, which occurs throughout Baja California but barely touches the mainland, is particularly abundant. The wild fig tree of the Gulf plasters itself against cliffs, its long white roots twining down over the red lava surfaces. There are many antelope jack rabbits hopping about, flashing a large patch of white fur first on one side of their rump and then on the other. This gives

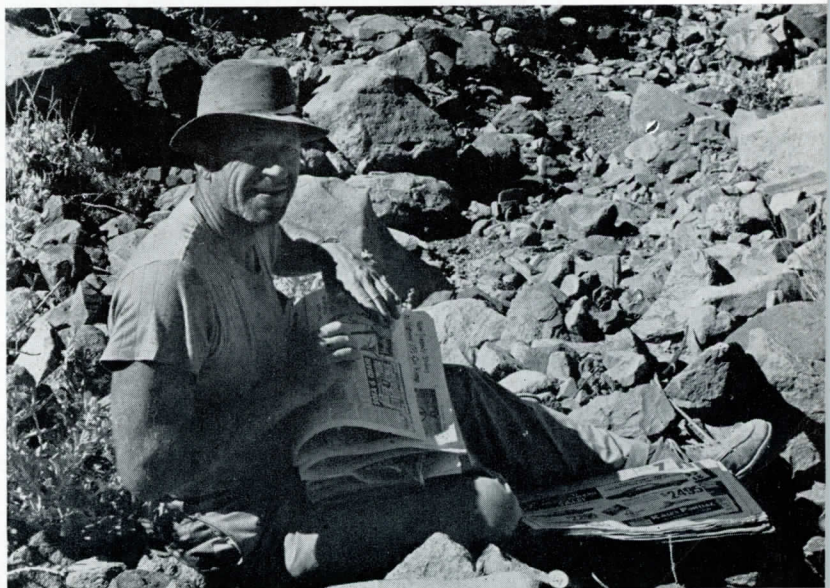


Above, Ray Bandar with an insect flight trap on Isla San Esteban. White cloths in his belt are snake bags.



Marine invertebrate biologist Virgilio Arenas F., of the Instituto de Biología de México, examining jellyfish which he collected at Isla Salsipuedes.

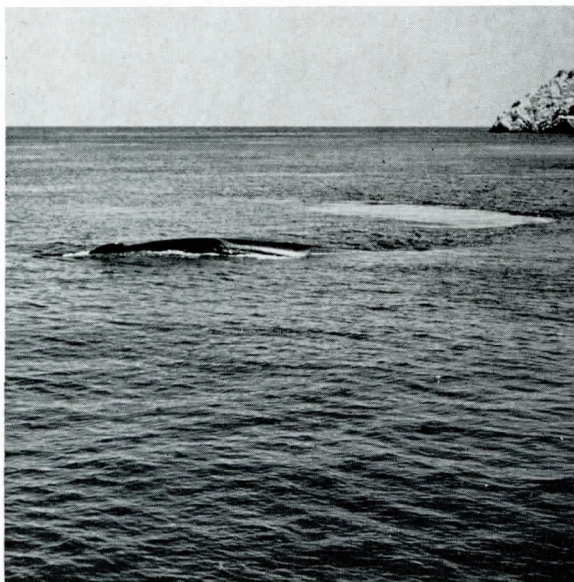
Below, botanist Reid Moran found several kinds of plants not before reported from the islands.



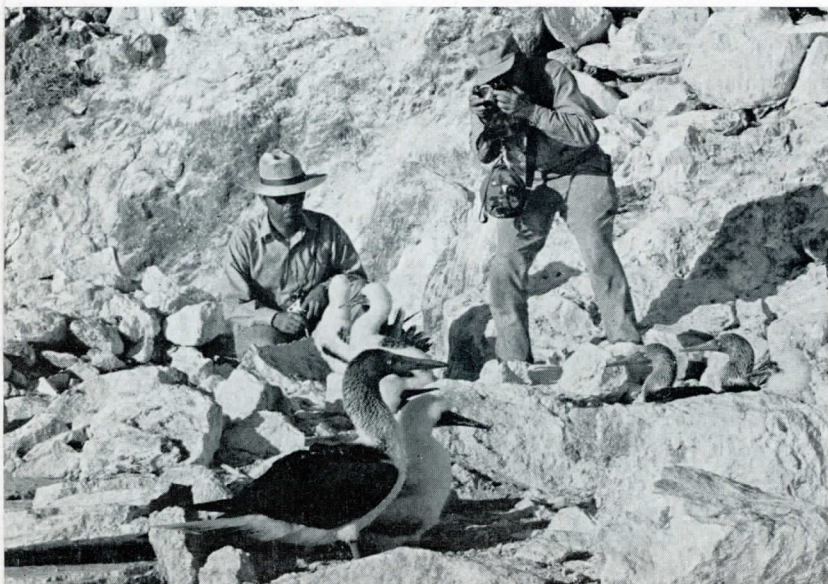


Above, Dick Banks and Ken Lucas with the sonora racer which Dick Phillips (holding the snake) found on Isla Turner.

A
finback whale
more than
sixty feet long
swam close to
the ship at
Isla San Pedro
Martir.
These great
mammals
were seen
every day,
often very close
to shore.



Below, blue-footed booby birds were photographed on their nests by Tom Tilton and Robert Orr.



the impression that the hare is changing course and may confuse a pursuing predator, such as a coyote.

The Seris had primitive camps along the shore, which are still marked by fire pits, potsherds, metates, and forked poles which held up brush shelters. Ray Bandar found human skeletons and charred fragments of woven matting and baskets in a cave. Many natural caves were fire blackened and contained metates and manos, stones used to grind seeds, and other evidence of occupation. Ken Lucas found many specimens of three species of scorpions on the island. Dick Phillips caught a red racer snake (*Masticophis flagellum*) in a palo verde tree, no mean accomplishment, and the following day collected a Sonoran racer (*Masticophis bilineatus*) on nearby Turner Island, a new record, and established himself as the racer specialist of the expedition. Moran said that he was racer sharp.

We were to visit many islands on this trip, thirteen in all. One of the most interesting was San Pedro Mártir, a huge rock a thousand feet high and less than a mile across, isolated in the middle of the Gulf. Its towering cliffs, whitewashed with guano, plunge into clear, deep water, and at only a few places can they be scaled. There are not many kinds of plants on the island, but abundant dwarf cardón cacti look like a piñon forest from a distance, and an orange globe-mallow forms an understory. Only three kinds of reptiles live there, a rattlesnake and two endemic lizards, and no native land mammals have been found.

We approached from the north and were met by a vanguard of swimming sea lions. Thousands of birds circled overhead—boobies, pelicans, terns, and white tropic birds with long streaming tail-feathers. Suddenly the sea erupted with splashing fish. Schools of yellowtail, acres in extent, slashed at smaller fishes on which they were feeding. These jumped into the air in their futile rush to escape. The turmoil attracted the birds which came in droves from all directions, and poured off the island. Pelicans flapped along, watching the surface, then pointed their heads down and dove with a great splash, flopped their wings on the water, righted themselves, and raised their beaks high to position their catch for a head-first down-the-hatch. Terns hovered a few feet from the water, then swooped to dip up the little fish without wetting a feather. Boobies were the best divers of all. Flying high, they suddenly dove, guiding themselves with half-folded wings which they tucked in just before they hit the water. Long submergence may mean that they chase fish underwater, and broad webbed feet indicate they are powerful and fast swimmers.

Cormorants did not dive, but pursued their prey while completely submerged.

We anchored close in under cliffs, at the base of which was a narrow beach covered with sea lions. A finback whale more than sixty feet long, and a young one half its length, swam majestically by. They were very close to shore and to the ship, and they turned to avoid collision. Usually only the top of its head was exposed when one surfaced to blow, but once the youngster came out of the water vertically, exposing its pleated throat which allows it to strain great mouthfuls of water for the krill on which it feeds.

Some of us took a small boat around the island, stopping from time to time for Dick Phillips to collect rock samples. The shore line was covered with silent pelicans. As we approached they looked apprehensive, tentatively spread their wings and teetered indecisively, trying to make up their minds whether to flap off or stay. Such decisions seemed difficult for the birds, but if a timid one decided to bolt, usually all would follow. They did not squawk or cry out, and the only sound as they took to the air was the swish of their wingbeats.

There were many sea lions, too, and a boisterous group of juveniles raced us, porpoising along in front of or behind our boat. When we stopped

they stopped also, and rose shoulder high out of the water, watching us. When we started the race was resumed. We rounded one rock face closely and they were on the inside lane. In the excitement one young fellow forgot his natural sonar and ran into the cliff and looked chagrined.

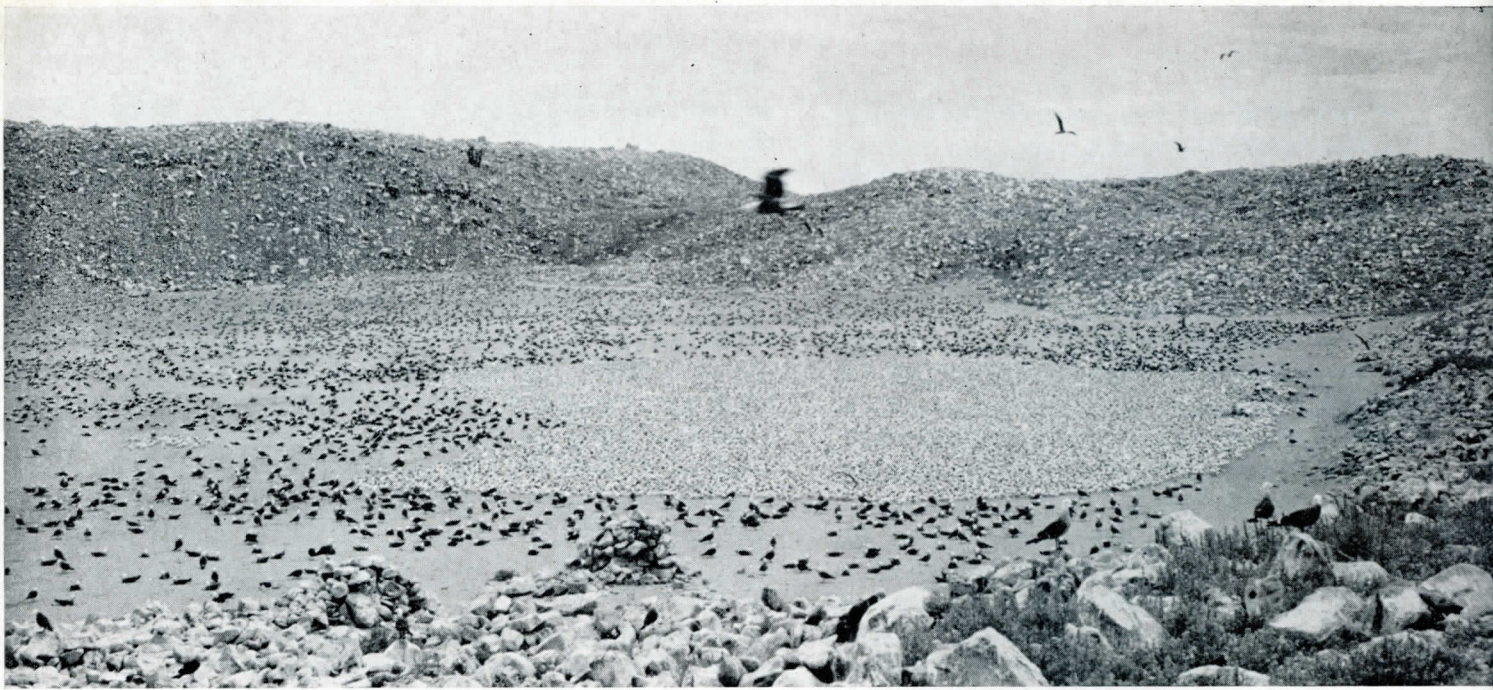
Blue-footed boobies were nesting all over the island, even on ledges in the sea caves, where one slip meant egg or chick would fall into the water. When we climbed the island it was impossible to avoid the birds, which are much braver, and noisier, than pelicans. Parent and young protested vigorously and pecked at our legs as we passed, but not many were frightened away. Those that flew usually dropped their ballast by up-chucking a few fish before take-off.

Down near the shore beautiful tropic birds nested in little recesses under large boulders. They also have sharp bills, which they did not hesitate to use, but they were brave and stayed on their nests.

San Pedro Mártir once had deep deposits of guano, the accumulation of centuries. This was harvested many years ago, and the company then went to great expense to build terraces on which the birds were expected to deposit more of their valuable product. Rock walls were constructed to hold the flat terraces, and have the appearance of Inca ruins after a snowstorm.

A blue-footed booby stayed to guard her eggs, although her more timid mate had dropped his fish dinner and departed.





Above, a valley on Isla Raza was covered with nesting Heermann gulls, and at one side was a densely packed colony of elegant terns. Right, Heermann gulls on nest. Far right, elegant terns nest less than one peck-distance apart.



Almost as if we were following a dramatic script, the most exciting and impressive experience was on the last day. That was on Isla Raza, the nesting place of Heermann gulls and royal and elegant terns. The history of Raza is now well known (*Pacific Discovery*, July-August 1965). Each spring the gulls and terns, which have spent the winter scattered over the eastern Pacific, follow some unchangeable instinct which leads them inexorably to Raza to breed and lay and incubate eggs and raise chicks. For more than half a century egg collectors have usually arrived at Raza even before the birds, and gathered canoe loads of eggs as they were laid, to be taken to the markets of San Felipe, Santa Rosalia, Guaymas, and even La Paz. This went on for many years without serious consequences. But recently more canoes came each year, and the eggers stayed through the nesting season of the birds. This could have but one result, and

three years ago the bird population was in danger of collapse. There was a strong possibility that these handsome creatures might become extinct.

Biologists sounded an alarm, particularly Lewis Wayne Walker, and the Belvedere Scientific Fund promptly had the area investigated and advanced funds for the protection of the island. On May 30, 1964, President Lopez Mateos signed a decree which established Isla Raza as a migratory waterfowl sanctuary. Carl Buchheister, president of the National Audubon Society, asked us to see what the result had been on the bird population.

We clambered ashore over slippery boulders, and were astonished by what we saw. Evenly spaced over much of the island were Heermann gulls, standing erect and dignified over clutches of one to three eggs. There were thousands and thousands of these beautiful gulls, which rose in a wave as we walked through, and immediately settled

The beautiful and lonely islands of the Gulf of California are natural laboratories for the study of speciation and biogeography. They have long held the interest of Academics and other scientists, and they still hold secrets to be investigated.

behind us. The din of their loud mewing calls was constant.

Topping a low hill we looked over a flat valley, clear of stones, perhaps a quarter of a mile long and half as wide. The mosaic of gulls extended across the valley. But at one side there was an unbelievably dense colony, perhaps two acres in extent, of elegant terns. It must have contained nearly 100,000 birds, and each one seemed to be giving its gritty cry. Unlike the sedate gulls, the terns were quivering with nervous energy, and a layer of airborne birds, trying to squeeze down into the mass, was met by the sharp upturned beaks of those already on the ground. They were packed in, more than one to every square foot, and were constantly bickering with each other, sparring with sharp bills. The white and gray blanket shimmered in the sun.

Something startled a group at the edge of the colony and they rose in a cloud. Surrounding gulls walked in quickly and began eating their eggs. The terns returned in waves, and the gulls retreated before them.

We were profoundly moved by the awesome sights and cacophony of sound which surrounded us, and gratified by the success of the conservation efforts which have preserved the birds of Isla Raza. This is a splendid example of international cooperation to protect birds which know no political boundaries.

So that was the Gulf Island Expedition of 1966. The collections made on thirteen islands are now at the Academy and the Museum and the



Captain Francisco Muñoz flew to Bahía de los Angeles to pick up our party and its collections for the return flight to Tijuana. The San Diego Natural History Museum's field vehicle, here delivering expedition gear to the plane, and its Vermilion Sea Field Station were of great use to the biologists.

Instituto. Already we know it was a successful trip, scientifically, and that it added to our knowledge of an interesting area. New kinds of things were found. Significant observations were made. Scientific papers based on the trip are already in press.

The trip was also fun. There is real pleasure in associating with dedicated men who have deep interest in the world around them. There was pleasure in helping lift a boulder so John Sloan could catch a rattlesnake which may be an undescribed form, in watching Ken Lucas stalking a giant chuckwalla sleeping on a cardón, in associating with our Mexican colleagues, the professional biologists, and our Mexican friends who operated the aircraft and the boats and the ship. And the oyster and turtle barbecue on a rock spit was fun. Those are some of the memories of the Gulf Island Expedition of 1966. 